REMARKS

In this Amendment, Applicants are amending Claims 1-3. Accordingly, Claims 1-31 are currently pending in the Application.

In the Office Action mailed August 29, 2002, the Examiner rejected Claim 2 under 35 U.S.C. § 112, first paragraph. To the extent that the rejection applies to the amended claim, Applicants respectfully traverse the rejection.

Applicants have amended Claim 2 to recite an amount of boron is 0.0005 to 5.0 wt% of copper. Applicants respectfully submit that the limitation of the amount of boron is supported by the Specification as originally filed. Applicants respectfully request that the Examiner withdraw the rejection to Claim 2.

In the Office Action, the Examiner rejected Claims 1, 3-5, 19-20, 29 and 30 under 35 U.S.C. § 102(b) as being anticipated by Yamada et al. (U.S. Patent No. 5,589,299) ("Yamada"). To the extent that the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

In the rejection, the Examiner stated that Yamada teaches that the collector may comprise an alloy of iron-nickel-cobalt plated with copper or an alloy of nickel-copper plated with silver. Applicants respectfully submit that Yamada teaches various materials having catalytic action (Yamada, col. 3, line 63 to col. 4, line 7), and metals having no catalytic action (Yamada, col. 4, lines 17-25), and various laminate structures of the catalytic action metals with the no catalytic action metals (Yamada, col. 4, lines 45-65).

Yamada also teaches various laminate structures in the examples. Example 1 is a nickel foil plated with copper. Example 2 is a foamed nickel plated with copper. Example 3 is a nickel foil coated with silver. Example 4 is a stainless steel foil coated with gold. Example 5 is an alloy foil of iron-nickel-cobalt plated with copper. Example 6 is a copper foil having foamed nickel spot-welded to it. Example 7 is a copper foil with a nickel paste on it. Example 8 is a copper foil with a nickel oxide paste on it. Example 10 is a nickel foil with a copper powder coat on it. Example 11 is a copper foil with an iron acetate paste on it. (Yamada, col. 8, line 64 to col. 12, line 46.)

Applicants respectfully submit that Yamada does not teach or suggest the desirability of a copper-based alloy foil that comprises at least one material selected

from the group consisting of magnesium, tin, boron, chromium, manganese, cobalt, vanadium, zirconium, niobium, bismuth, lead, silver, and misch metal and further comprises a copper-based material selected from the group consisting of copper, copper/nickel, copper/titanium, and copper/nickel/titanium as recited in Applicants' independent Claims 1 and 3, nor does it teach or suggest the desirability of forming a copper-based alloy that includes at least two materials selected from the group consisting of nickel, titanium, magnesium, zinc, boron, chromium, manganese, silicon, cobalt, iron, vanadium, aluminum, zirconium, niobium, phosphorous, bismuth, lead, silver, and misch metal as recited in Applicants' independent Claims 4 and 19.

Applicants have attached to this Response a copy of page 36 of Hawley's Condensed Chemical Dictionary, which defines an alloy as "a solid or liquid mixture of two or more metals, or of one or more metals with certain non-metallic elements . . . the properties of alloys are often greatly different from those of the components." Applicants respectfully submit that plating multiple metals or a laminate structure of multiple elements is not the same as an alloy of multiple metal elements, and would not have the same properties.

Applicants respectfully request that the Examiner withdraw the rejection to Claims 1, 3-5, 19-20, 29 and 30 under 35 U.S.C. § 102(b).

In the Office Action, the Examiner rejected Claims 1, 4, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Idota et al. (U.S. Patent No. 5,686,203) ("Idota"). To the extent that the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

Applicants respectfully submit that Idota teaches, "examples of materials for current collectors are stainless steel, nickel, copper, titanium, aluminum, carbon, those obtained by treating the surface of for instance, copper and stainless steel with carbon, nickel, titanium or silver and Al-Cd alloys for the negative electrode, with copper and copper alloys being particularly preferred." (Idota, col. 16, lines 20-26.)

Applicants respectfully submit, that in order for the Examiner to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. The teaching or suggestion to

make the claim combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. (MPEP § 2142.)

Applicants respectfully submit that Idota does not teach or suggest all the claim limitations recited in Claims 1, 4, and 19, particularly those claim limitations regarding copper-based alloys outlined above.

Applicants respectfully submit that Idota teaches treating the surface of aluminum and stainless steel with carbon, nickel, titanium or silver for the positive electrode, and treating the surface of copper and stainless steel with carbon, nickel, titanium, or silver and Al-Cd alloys for the negative electrode. (Idota, col. 16, lines 13-26.) As discussed above, Applicants respectfully submit that plating or surface modification with multiple metals is not the same as an alloy.

Applicants respectfully request that the Examiner withdraw the rejection to Claims 1, 4, and 19 under 35 U.S.C. § 103(a).

In the Office Action, the Examiner rejected Claims 1, 4, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Yamahira et al. (U.S. Patent No. 5,601,950) ("Yamahira"), as evidenced by Idota. To the extent that the rejection applies to the amended claims, Applicants respectfully traverse the rejection.

The teachings of Idota are outlined above, and Applicants respectfully submit that Yamahira teaches, "the current collector may comprise copper, nickel, cobalt, iron, chromium, molybdenum, tantalum, tungsten, stainless steel, titanium, and mixtures thereof. The current collector preferably comprises copper, nickel, stainless steel, iron, or alloys thereof." (Yamahira, col. 3, lines 39-43.) As the Examiner noted, Yamahira does not explicitly state any particular alloys for the current collector.

As discussed above, to establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Since Yamahira and Idota, alone or in combination, do not teach or suggest the desirability of all the claim limitations recited in Claims 1, 4, and 19, particularly those outlined above, the Examiner has failed to establish a *prima facie* case of obviousness of Claims 1, 4, and 19.

Applicants respectfully submit that Yamahira teaches that the negative electrode is constituted by a carbon sintered mass obtained on sintering the carbonaceous material or a carbon sintered mass-current collector composite material. (Yamahira,

Abstract.) Yamahira also teaches against using a binder for the negative electrode. (Yamahira, col. 2, lines 1-10.) Yamahira teaches one embodiment using a current collector where the negative electrode is a carbon sintered mass carried by a current collector made by inserting a current collector in the starting carbonaceous material before compression molding and sintering. (Yamahira, col. 3, lines 25-34.)

Alternatively, Applicants respectfully submit that Idota teaches binders for the electrodes. (Idota, col. 13, lines 47-58.) In addition, Idota teaches compression molding the electrodes or coating active materials onto a current collector, drying, and compressing the electrodes, with various types of coating disclosed. (Idota, col. 16, lines 39-52.) However, Idota does not teach or suggest the desirability of sintering the electrodes or making the electrodes without a binder. In fact, Idota teaches against the teachings of Yamahira, since Yamahira uses a sintering operation without a binder, while Idota uses alternative methods to produce the electrodes with a binder. Applicants respectfully submit that there is no motivation or suggest to combine the references.

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness since there is no suggestion of motivation to combine the reference teachings, and that there is actually teaching away from combining the reference teachings. Applicants respectfully request that the Examiner withdraw the rejection to Claims 1, 4, and 19.

In the Office Action, the Examiner stated that Claims 6-18, 21-25, 26-28, and 31 contain allowable subject matter. Applicants would like to thank the Examiner for stating that those claims contain allowable subject matter.

Attached hereto is a marked-up version of the change made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§1.16 or 1.17, particularly, extension of time fees.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 11/27/02

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CERTIFICATE OF MAILING:

I hereby certify that this correspondence is being deposited as First Class Mail with the United States Postal Service in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on November 27, 2002.

Nadya Gordon 11/27/02
Nadya Gordon *Date*

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

The claims are amended as follows.

1. (Three Times Amended) A lithium secondary battery comprising:

a positive electrode formed by coating a lithium metal oxide on a positive current collector;

a negative electrode formed by coating carbonaceous materials or SnO_2 on a negative current collector, where the negative current collector is made of a Cu-based alloy foil with a thickness of 20 μm or less and the Cu-based alloy foil ~~is prepared by adding~~comprises at least one material selected from the group consisting of magnesium, tin, boron, chromium, manganese, cobalt, vanadium, zirconium, niobium, bismuth, lead, silver, and misch metal ~~to~~ and further comprises a copper-based material selected from the group consisting of copper, copper/nickel, copper/titanium, and copper/nickel/titanium, wherein the Cu-based alloy foil is produced by a plating process;

a separator interposed between the positive and negative electrodes; and

an electrolyte into which the positive and negative electrodes and the separator are immersed.

2. (Twice Amended) The lithium secondary battery of claim 1 wherein an amount of nickel is 0.8 to 4 wt% of copper, an amount of titanium is 0.2 to 4 wt% of copper, an amount of magnesium is 0.05 to 0.6 wt% of copper, an amount of tin is 0.1 to 2.0 wt% of copper, an amount of boron is 0.0005 to ~~0.5~~5.0 wt% of copper, an amount of chromium is 0.0005 to 0.5 wt% of copper, an amount of manganese is 0.1 to 1.0 wt% of copper, an amount of cobalt is 0.01 to 2.0 wt% of copper, an amount of vanadium is 0.0005 to 0.5 wt% of copper, an amount of zirconium is 0.0005 to 0.5 wt% of copper, an amount of niobium is 0.0005 to 0.5 wt% of copper, an amount of bismuth is 0.0005 to 0.5 wt% of

copper, an amount of lead is 0.0005 to 0.5 wt% of copper, and an amount of silver is 0.0005 to 0.5 wt% of copper.

3. (Three Times Amended) A method for making a lithium secondary battery comprising:

forming a positive electrode by coating a lithium metal oxide on a positive current collector;

forming a negative electrode by coating carbonaceous materials or SnO_2 on a negative current collector, where the negative current collector is made of a Cu-based alloy foil with a thickness of 20 μm or less and the Cu-based alloy foil ~~is prepared by adding~~comprises at least one material selected from the group consisting of magnesium, tin, boron, chromium, manganese, cobalt, vanadium, zirconium, niobium, bismuth, lead, silver, and misch metal ~~to~~ and further comprises a copper-based material selected from the group consisting of copper, copper/nickel, copper/titanium, and copper/nickel/titanium, wherein the Cu-based alloy foil is produced by a plating process;

interposing a separator between the positive and negative electrodes; and

injecting an electrolyte to immerse the positive and negative electrodes and the separator.

allomorphism. A physical change in a mineral without the gain or loss of components.

alloocimene. (2,6-dimethyl-2,4,6-octatriene). $(CH_3)_2C(CH)_3CCH_3CHCH_3$.
Properties: Clear, almost colorless liquid. Boiling range (5–95%) 89–91C (20 mm), d 0.824 (15/15C), refr index 1.5278 (20C). Polymerizes and oxidizes readily. Combustible.
Derivation: Pyrolysis of α-pinene.
Use: Component of varnishes and a variety of polymers; fragrance.

allophanamide. See biuret.

allophanate. An unsaturated nitrogenous product made by reaction of an alcohol with two moles of isocyanic acid (a gas). Usually crystals, high-melting products that are easily isolated. Acid-sensitive and tertiary alcohols can be converted into allophanates.

Δ-allose. (β-*d*-allopyranose). $C_6H_{12}O_6$.
Properties: Crystals. Mp 128C, mw 180.16. Soluble in water; insoluble in alcohol.
Derivation: Obtained from the leaves of *Protea rubropilosa*.

allothreonine. See threonine.

allotrope. One of several possible forms of a substance.
See allotropy.

allotropy. (polymorphism).
The existence of a substance in two or more forms that are significantly different in physical or chemical properties. The difference between the forms involves either (1) crystalline structure, (2) the number of atoms in the molecule of a gas, or (3) the molecular structure of a liquid. Carbon is a common example of (1), occurring in several crystal forms (diamond, carbon black, graphite) as well as several amorphous forms. Diatomic oxygen and triatomic ozone are instances of (2), and liquid sulfur and helium of (3). Uranium has three crystalline forms, manganese four, and plutonium no less than six. A number of other metals also have several allotropic forms that are often designated by Greek letters, e.g., α-, γ-, and Δ-iron.

alloxan. (mesoxalylurea). $C_4H_2O_4N_2{\cdot}H_2O$ and $4H_2O$.
Properties: White crystals, become pink on exposure to air; colorless aqueous solution that imparts pink color to skin. Mp 170C (decomposes) (various melting points in literature). Soluble in water and alcohol.
Derivation: Oxidation of uric acid in acid solution.
Use: Biochemical research, cosmetics, organic synthesis.

alloy. A solid or liquid mixture of two or more metals, or of one or more metals with certain nonmetallic elements, as in carbon steels. The properties of alloys are often greatly different from those of the components. The purpose of an alloy is to improve the specific usefulness of the primary component—not to adulterate or degrade it. Gold is too soft to use without a small percentage of copper. The corrosion and oxidation resistance of steel is markedly increased by incorporation of from 15–18% of chromium and often a few percent of nickel (stainless steel). The presence of up to 1.5% carbon profoundly affects the properties of steels. Similarly, a low percentage of molybdenum improves the toughness and wear resistance of steel. The hundreds of special alloys available are the results of designs to meet specific operating conditions. Amorphous alloys for use in transformer coils are made by quick-quenching the melt.
See alloy, fusible; amalgam; superalloy.

alloy, fusible. (low-melting alloy; fusible metal).
An alloy melting in the range of approximately 51–260C, usually containing bismuth, lead, tin, cadmium, or indium. Eutectic alloys are the particular compositions that have definite and minimum melting points compared. The compositions of a few fusible alloys are given below:

System	Composition	Eutectic Temperature (C)
Cd-Bi	60 Bi–40 Cd	144
In-Bi	33.7 Bi–66.3 In	72
	67.0 Bi–33 In	109
Pb-Bi	56.5 Bi–43.5 Pb	125
Sn-Bi	58 Bi–42 Sn	139
Pb-Sn-Bi	52 Bi–16 Sn–32 Pb	96
Pb-Cd-Bi	52 Bi–8 Cd–40 Pb	92
Sn-Cd-Bi	54 Bi–20 Cd–26 Sn	102
In-Sn-Bi	58 Bi–17 Sn–25 In	79
Pb-Sn-Cd-Bi	*50 Bi–10 Cd–13.3 Sn–26.7 Pb	70
In-Pb-Sn-Bi	49.4 Bi–11.6 Sn–18 Pb–21 In	57
In-Cd-Pb-Sn-Bi	44.7 Bi–5.3 Cd–8.3 Sn–22.6 Pb–19.1 In	47

*Wood's metal.

alloy steel. A steel containing up to 10% of elements such as chromium, molybdenum, nickel, etc., usually with a low percentage of carbon. These added elements improve hardenability, wear resistance, toughness, and other properties. This term includes low-alloy steels in which the alloy content does not exceed 5%, but does not include stainless steel.
See steel.

allylacetone. (5-hexene-2-one). $CH_2CHCH_2CH_2COCH_3$.